Spot Safety Project Evaluation

Project Log # 200501154

Spot Safety Project # 09-99-202

Spot Safety Project Evaluation of the Median Crossover Closure at the Intersection of NC 67 – Silas Creek Pkwy and Forsyth Technical College Driveway, 0.15 mile East of Miller St in Forsyth County

Documents Prepared By:

Safety Evaluation Group
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_____ 01/17/2006
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Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 09-99-202 – The Intersection of NC 67 – Silas Creek Pkwy and Forsyth Technical College Driveway, 0.15 mile east of Miller St in Forsyth county.

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of the spot safety improvement. Additional analysis methods were not utilized for this evaluation because a suitable comparison group was unattainable. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the closure of the median crossover at the intersection of NC 67 and Forsyth Technical College driveway in order to prevent through movements from the driveway approaches, resulting in the only permitted movement after the improvement being left turn only for NC 67 westbound traffic. Forsyth Technical College's public safety director Sammy Dillon originally requested the improvements. NC 67 is a four-lane divided roadway with left turn lanes at the crossover. NC 67 has a speed limit of 45 mph. The crossover area is surrounded by a lot of businesses with direct access to NC 67.

The initial crash analysis for this location was completed from January 1, 1996 through January 1, 1999 with a total of eight (8) reported crashes. Six of the eight crashes were considered "correctable" and included 2 Rear End crashes, 1 Sideswipe crash, 1 U-Turn crash and 2 Left Turn crashes. There was 1 class A injury, 1 class B injury and 1 class C injury resulting from these crashes. The final completion date for the improvement at the subject intersection was on November 21, 2000 with a total cost of $85,000.

Naïve Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from October 1, 2000 through December 31, 2000. The before period consisted of reported crashes from July 1, 1996 through September 30, 2000 (4 Years and 3 months) and the after period consisted of reported crashes from January 1, 2001 through March 31, 2005 (4 Years and 3 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis included two different sets of data, the NC 67 strip and the subject crossover section. The treatment data for the NC 67 strip consisted of all crashes within 150 feet from 150 ft west of Miller St (MP 17.272) to 150 ft east of Lockland Ave (MP 17.878) of the subject intersection. The treatment data for the subject crossover section consisted of all crashes within a 0 feet Y-line on NC 67 from MP 17.4 to MP 17.5. Please see attached *Location Map* for further detail. The following data tables depict the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Overall Crash Data Summary:	**Before Period**	**After Period**	**Percent Reduction (-) / Percent Increase (+)**
NC 67 Strip :			
Total Crashes	125	166	32.8
Target Crashes	49	55	12.2
Crossover Section :			
Total Crashes	22	21	-4.5
Target Crashes	5	1	-80.0
Influenced Intersections :			
Intersection A "NC 67 @ Miller St"			
Total Crashes	53	72	35.8
Target Crashes	25	35	40.0
Intersection B "NC 67 @ Lockland Ave"			
Total Crashes	37	34	-8.1
Target Crashes	16	11	-31.3

NC 67 Strip Information:

	Before Period	**After Period**	**Percent Reduction (-) / Percent Increase (+)**
Total Crashes	**125**	**166**	**32.8**
Fatal Crashes	1	0	-100.0
Non Fatal Injury Crashes	51	71	39.2
Total Injury Crashes	52	71	36.5
PDO Crashes	73	95	30.1
Night Crashes	23	13	-43.5
Wet Crashes	14	30	114.3
Alcohol/ Drug Crashes	7	4	-42.9
Severity Index	5.72	4.99	-12.8
Fatal Injuries	1	0	-100.0
Class A	2	2	0.0
Class B	17	26	52.9
Class C	66	94	42.4
Non-Fatal Injuries	85	122	43.5
Total Injuries	86	122	41.9

	Before Period	After Period	Percent Reduction (-) / Percent Increase (+)
Total Target Crashes*	**49**	**55**	**12.2**
Fatal Crashes	0	0	N/A
Non Fatal Injury Crashes	23	21	-8.7
Total Injury Crashes	23	21	-8.7
PDO Crashes	26	34	30.8
Night Crashes	10	4	-60.0
Wet Crashes	3	6	100.0
Alcohol/ Drug Crashes	3	1	-66.7
Severity Index	4.47	5.07	13.4
Fatal Injuries	0	0	N/A
Class A	0	1	N/A
Class B	4	9	125.0
Class C	38	25	-34.2
Non-Fatal Injuries	42	35	-16.7
Total Injuries	42	35	-16.7
ADT	36000	40000	11.1

Crash Type Summary			Percent Reduction (-)/
NC 67 Strip	**Before**	**After**	**Percent Increase (+)**
Angle	**28**	**42**	50.0
Backing Up	2	3	50.0
Fixed Object	0	3	N/A
Head On	**2**	**2**	0.0
Left Turn, Different Roadways	**7**	**0**	-100.0
Left Turn, Same Roadway	**10**	**7**	-30.0
Not Available	3	0	-100.0
Other Collision with vehicle	1	2	100.0
Pedalcyclist	1	1	0.0
Pedestrian	1	0	-100.0
Ran Off Road - Left	3	0	-100.0
Ran Off Road - Right	2	6	200.0
Ran Off Road - Straight	1	1	0.0
Rear End, Slow or Stop	52	87	67.3
Rear End, Turn	2	0	-100.0
Right Turn, Different Roadways	**2**	**3**	50.0
Right Turn, Same Roadway	**1**	**0**	-100.0
Sideswipe, Same Direction	7	9	28.6

The naive before and after analysis at NC 67 – Silas creek Pkwy Strip From Miller St to Lockland Ave resulted in a 32.8 percent increase in Total Crashes, a 12.8 percent decrease in the Total Severity Index, and an 11.1 percent increase in Average Daily Traffic (ADT). There was also a 12.2 percent increase in Target Crashes and a 13.4 percent increase in the Target Crashes Severity Index. The before period ADT year was 1998 and the after period ADT year was 2003. From the above analysis it appears that NC 67 strip have had an increase in both the Total and the Target crashes from the before to the after period.

Crossover Section Information:

	Before Period	After Period	Percent Reduction (-) / Percent Increase (+)
Total Crashes	**22**	**21**	**-4.5**
Fatal Crashes	0	0	N/A
Non Fatal Injury Crashes	7	7	0.0
Total Injury Crashes	7	7	0.0
PDO Crashes	15	14	-6.7
Night Crashes	2	3	50.0
Wet Crashes	2	4	100.0
Alcohol/ Drug Crashes	1	2	100.0
Severity Index	6.46	3.47	-46.3
Fatal Injuries	0	0	N/A
Class A	1	0	-100.0
Class B	3	3	0.0
Class C	7	9	28.6
Non-Fatal Injuries	11	12	9.1
Total Injuries	11	12	9.1
	Before Period	**After Period**	**Percent Reduction (-) / Percent Increase (+)**
Total Target Crashes*	**5**	**1**	**-80.0**
Fatal Crashes	0	0	N/A
Non Fatal Injury Crashes	2	0	-100.0
Total Injury Crashes	2	0	-100.0
PDO Crashes	3	1	-66.7
Night Crashes	0	1	N/A
Wet Crashes	1	1	0.0
Alcohol/ Drug Crashes	0	0	N/A
Severity Index	17.64	1	-94.3
Fatal Injuries	0	0	N/A
Class A	1	0	-100.0
Class B	1	0	-100.0
Class C	0	0	N/A
Non-Fatal Injuries	2	0	-100.0
Total Injuries	2	0	-100.0
ADT	36000	40000	11.1

Crash Type Summary	Before	After	Percent Reduction (-) / Percent Increase (+)
Angle	**0**	**1**	**N/A**
Backing Up	1	0	-100.0
Left Turn, Different Roadways	**2**	**0**	**-100.0**
Left Turn, Same Roadway	**3**	**0**	**-100.0**
Not Available	1	0	-100.0
Ran Off Road - Left	2	0	-100.0
Ran Off Road - Right	0	1	N/A
Rear End, Slow or Stop	9	18	100.0
Sideswipe, Same Direction	4	1	-75.0

The naive before and after analysis at the Crossover Section resulted in a 4.5 percent decrease in Total Crashes, a 46.3 percent decrease in the Total Severity Index, and an 11.1 percent increase in Average Daily Traffic (ADT). There was also an 80.0 percent decrease in Target Crashes and a 94.3 percent decrease in the Target Crashes Severity Index. The before period ADT year was 1998 and the after period ADT year was 2003.

Additional Analysis

In order to test for crash migration, a naïve before and after analysis was also performed at the two Intersections (east and west of the treatment site) effected by the spot safety improvements.

The two signalized intersections on NC 67 – Silas Creek Pkwy analyzed are as follows:

Location 1 - The intersection of NC 67 and Miller St located approximately 0.15 miles west of the treatment crossover.
Location 2 – The Intersection of NC 67 and Lockland Ave located approximately 0.4 miles east of the treatment crossover.

The data for both intersections consisted of all crashes within a 150 feet Y-line. The following tables are a summary of the naïve before and after analysis for both the Total Crashes and Target Crashes at the two influenced intersections.

NC 67 @ Miller St Information:

	Before Period	After Period	Percent Reduction (-) / Percent Increase (+)
Total Crashes	**53**	**72**	**35.8**
Total Severity Index	4.21	6.29	49.4
Total Target Crashes	**25**	**35**	**40.0**
Target Severity Index	4.85	8.29	70.9

The naive before and after analysis at the Intersection of NC 67 and Miller St resulted in a 35.8 percent increase in Total Crashes, a 49.4 percent increase in the Total Severity Index. There was also a 40.0 percent increase in Target Crashes and a 70.9 percent increase in the Target Crashes Severity Index. The before period ADT year was 1998 and the after period ADT year was 2003. From the above analysis it can be seen that the intersection of NC 67 and Miller St have had an increase in both total and target crashes from the before to the after period, note that Miller St is only 0.15 miles west of the treatment site.

NC 67 @ Lockland Ave Information:

	Before Period	After Period	Percent Reduction (-) / Percent Increase (+)
Total Crashes	**37**	**34**	**-8.1**
Total Severity Index	6.45	3.18	-50.7
Total Target Crashes	**16**	**11**	**-31.3**
Target Severity Index	4.7	3.02	-35.7

The naive before and after analysis at the Intersection of NC 67 and Lockland Ave resulted in an 8.1 percent decrease in Total Crashes, a 50.7 percent decrease in the Total Severity Index. There was

also a 31.3 percent decrease in Target Crashes and a 35.7 percent decrease in the Target Crashes Severity Index. The before period ADT year was 1998 and the after period ADT year was 2003. From the above analysis it can be seen that the intersection of NC 67 and Lockland Ave have had a decreases in both total and target crashes from the before to the after period. This may indicate that this intersection had a minimal effect by the improvement, note that Lockland Ave is located 0.4 miles east of the treatment site.

Results and Discussion

The naive before and after analysis at the Treatment location resulted in a 4.5 percent decrease in Total Crashes and a 46.3 percent decrease in the Total Severity Index. Analysis of the treatment location also resulted in an 80.0 percent decrease in Frontal Impact Crashes and a 94.3 percent decrease in Frontal Impact Crashes Severity Index. The summary results above demonstrate that the treatment location appears to have had a reduction in both the severity and the number of crashes from the before to the after period.

The median crossover closure prevents through and left turn movements for the Forsyth Technical College driveway and the driveway to Biscuitville. Motorists wishing to make these movements need to find an alternative route (i.e. potential crash migration occurs). Therefore, the effect of the treatment location on the surrounding median crossovers and intersections must remain in consideration while assessing analysis of the Treatment Intersection. The only permitted movement left at the new configuration of the crossover is the left turn for NC 67 westbound traffic.

The naïve before and after analysis of the potential influenced intersections resulted in a 35.8 percent increase in Total crashes and a 40.0 percent increase in Target crashes from the before to the after period for the first location (NC 67 @ Miller St). For the Second location (NC 67 @ Lockland Ave) there was an 8.1 percent decrease in Total crashes and a 31.3 percent decrease in Target crashes from the before to the after period. The above statistics show minimal effect on the second location while the first location experienced a significant increase in the number and the severity of both total and target crashes and this may be attributed to the traffic migration due to the crossover closure. *Please see attached crash analysis and collision diagrams for NC 67 @ Miller.*

The naïve before and after analysis for the whole NC 67 strip from Miller St to Lockland Ave resulted in a 32.8 percent increase in Total crashes and a 12.2 percent increase in Target crashes from the before to the after period. Looking at the crash analysis and the collision diagrams it can be seen that Rear End is the predominant crash type in both the before and the after period with a 67.3 % increase and this may be due to the heavy traffic and the driveway entrances to several businesses along both sides of NC 67 section. *Please see attached Photos and Collision Diagrams.*

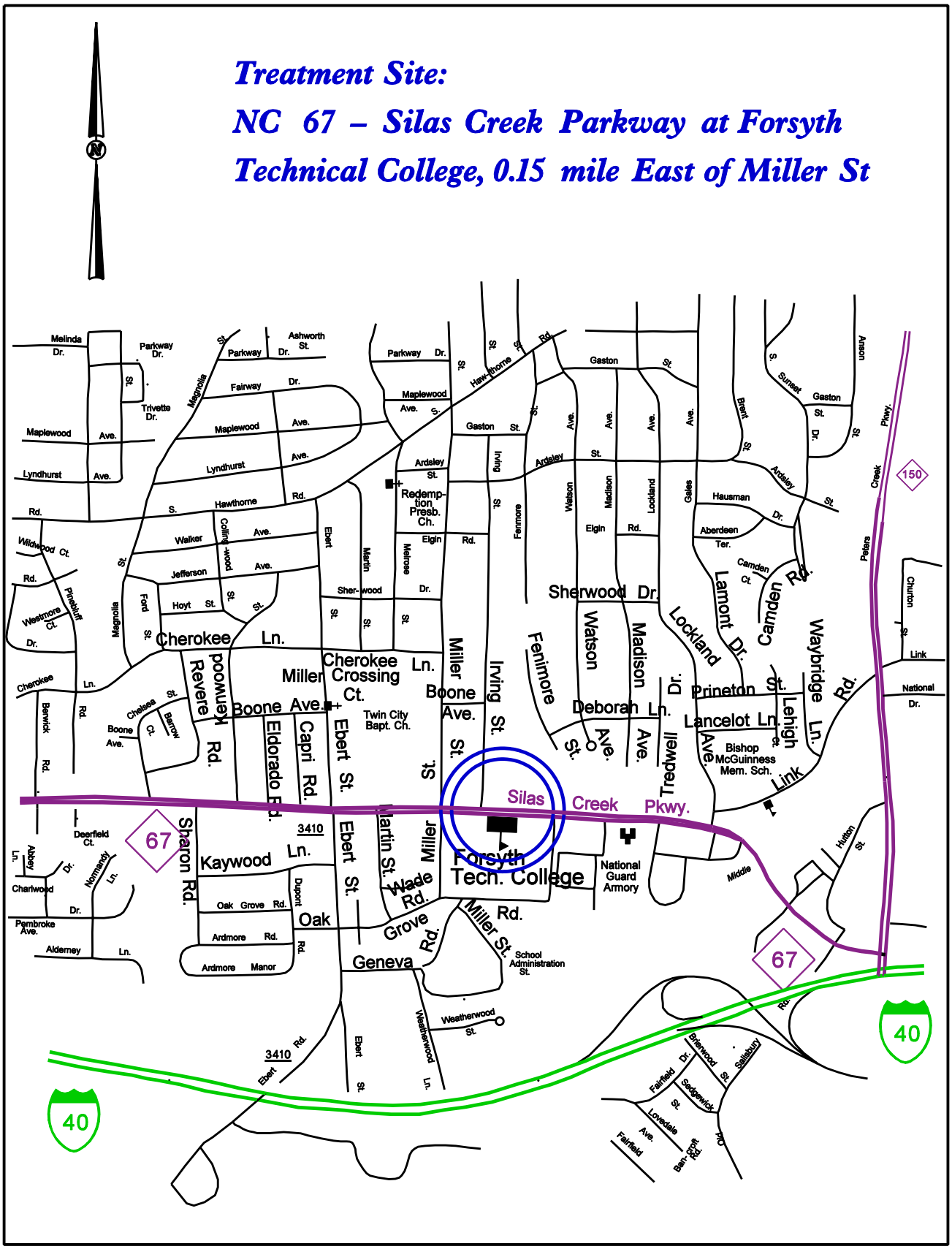
Also from the collision diagrams and crash reports it can be seen that a pattern of Rear End crashes developed right before Miller St in the after period (100 % increase from the before to the after period). The original study had documents showing a proposed extension of the left turn lane at Miller St to overcome the increased demand on Left-Turn and U-Turn movements due to the improvement but there is no evidence showing that the extension has occurred. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Evaluation of Spot Safety Project Number 09–99–202

Location Map, Forsyth County

Treatment Site:

NC 67 – Silas Creek Parkway at Forsyth Technical College, 0.15 mile East of Miller St



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Treatment Site Photos Taken on November 14, 2005

Driving East on NC 67 Toward Miller St

Driving East on NC 67 Toward Entrance to Forsyth Tech. College

Looking North from Crossover at Main Entrance of Forsyth Tech. College

Looking East at Crossover East of Main Entrance of Forsyth Tech. College

Looking West at the Main Entrance of Forsyth Tech. College Crossover

Looking West at the Main Entrance of Forsyth Tech. College Crossover

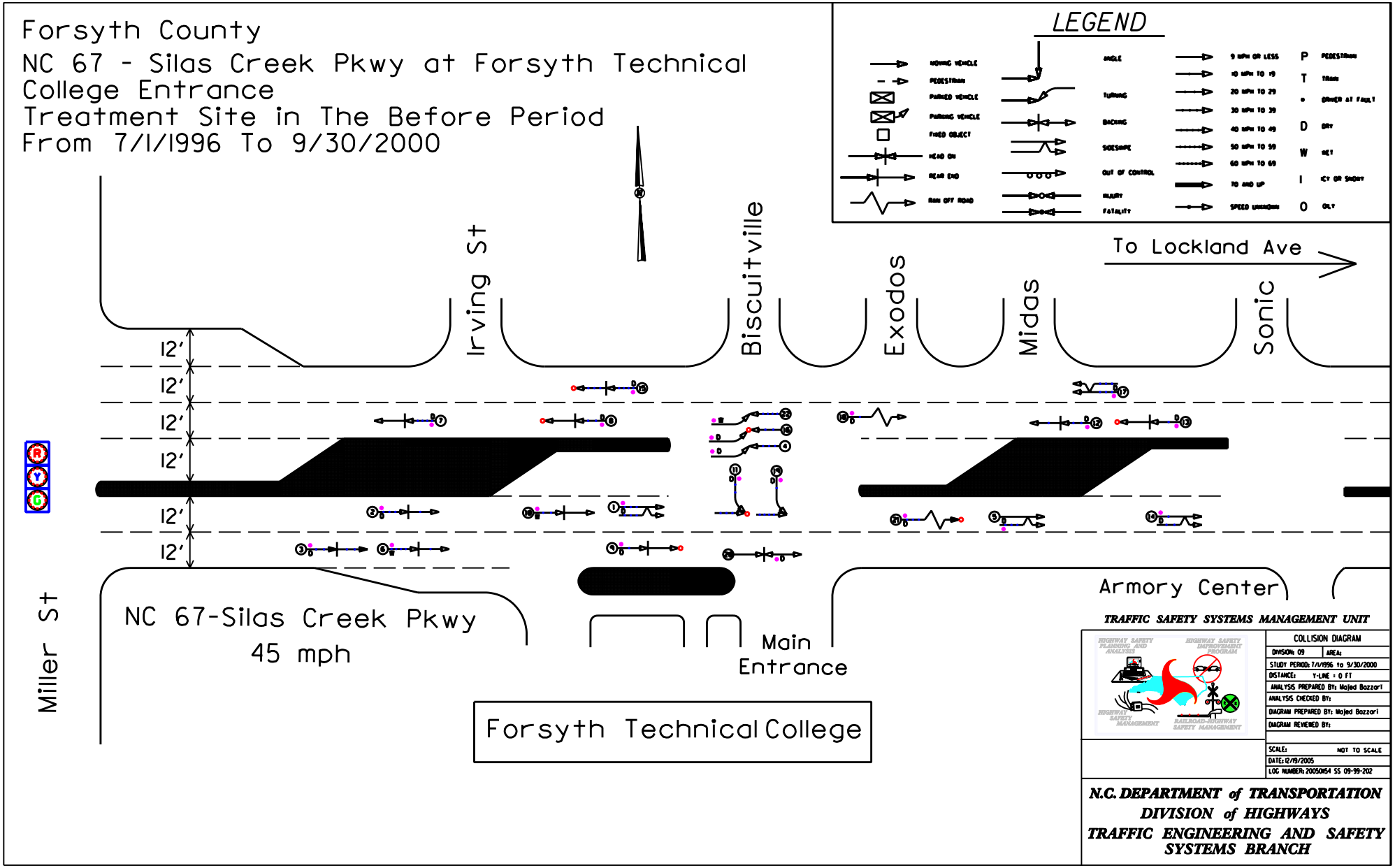
Driving East towards Lockland Ave

Forsyth County

NC 67 - Silas Creek Pkwy at Forsyth Technical College Entrance

Treatment Site in The Before Period

From 7/1/1996 To 9/30/2000



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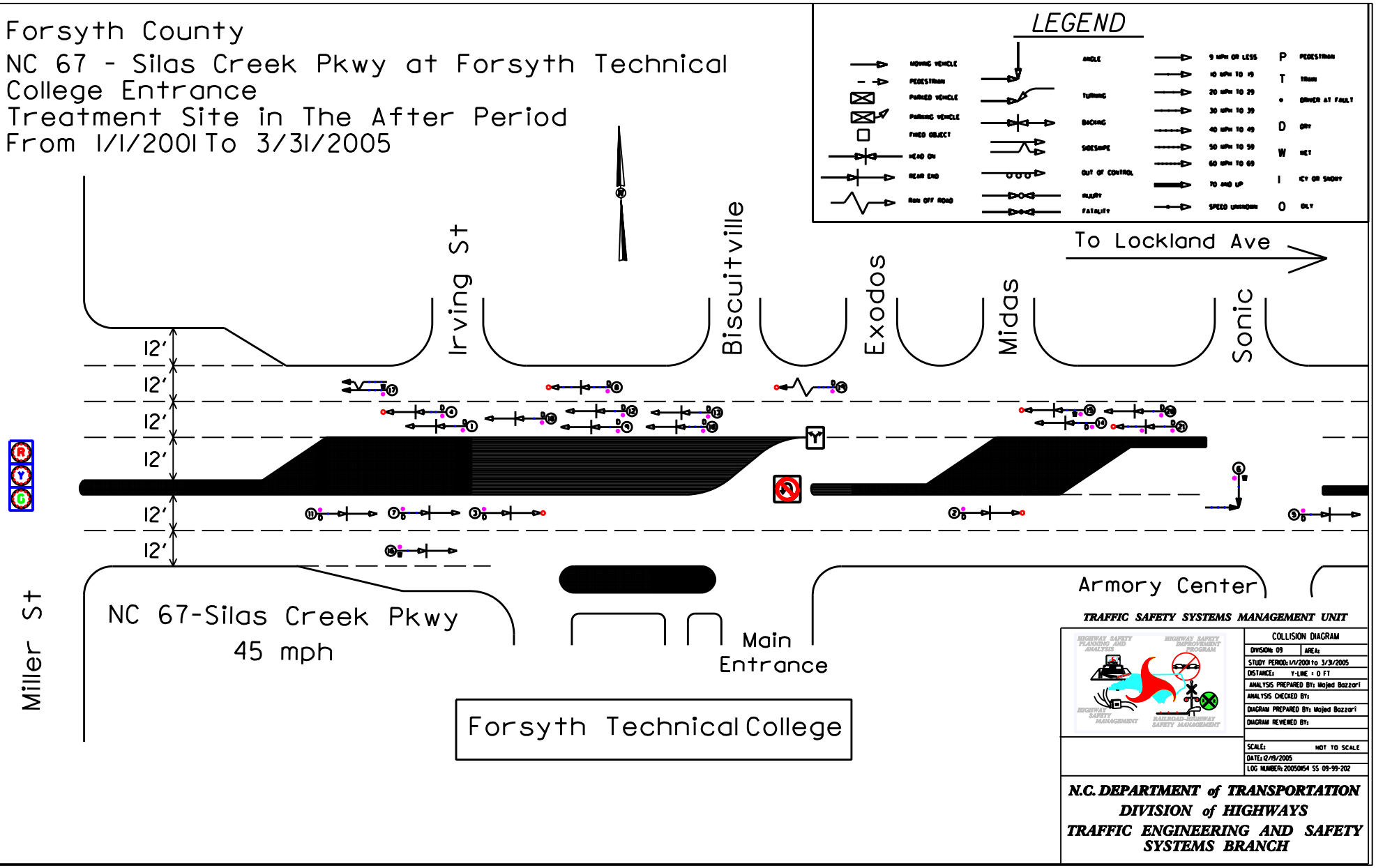
Forsyth County

NC 67 - Silas Creek Pkwy at Forsyth Technical College Entrance

Treatment Site in The After Period

From 1/1/2001 To 3/31/2005



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 09	AREA:
STUDY PERIOD: 1/1/2001 to 3/31/2005	
DISTANCE:	Y-LINE = 0 FT
ANALYSIS PREPARED BY: Majed Bazzari	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: Majed Bazzari	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE: 12/19/2005	
LOG NUMBER: 20050154 SS 09-99-202	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

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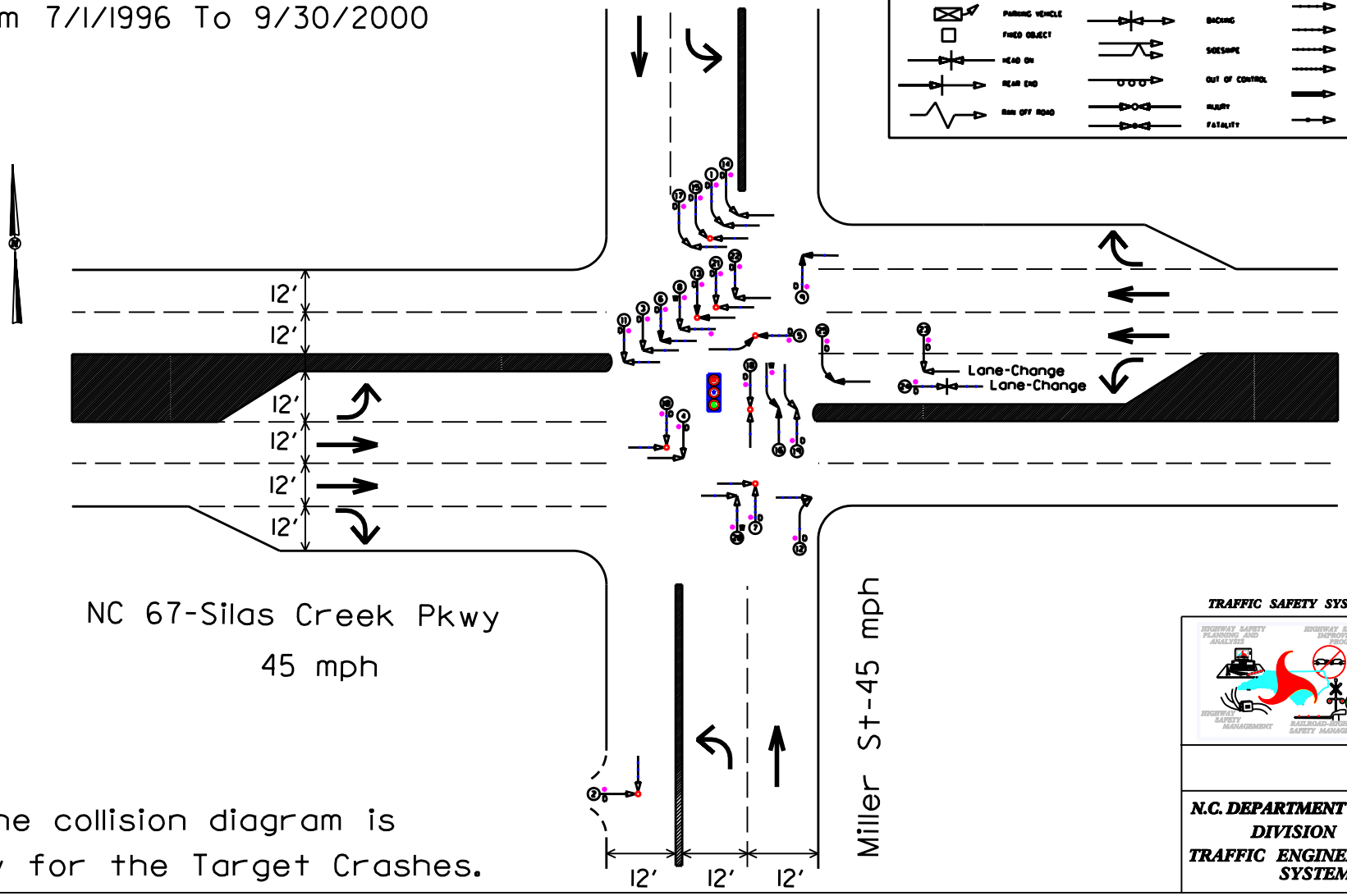
Forsyth County
NC 67 - Silas Creek Pkwy at Miller St
Treatment Site in The Before Period
From 7/1/1996 To 9/30/2000



* The collision diagram is only for the Target Crashes.

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 09	AREA:
STUDY PERIOD: 7/1/1996 to 9/30/2000	
DISTANCE:	Y-LINE ± 0 FT
ANALYSIS PREPARED BY: Majed Bazzari	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: Majed Bazzari	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE: 12/19/2005	
LOG NUMBER: 20050154 SS 09-99-202	

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DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

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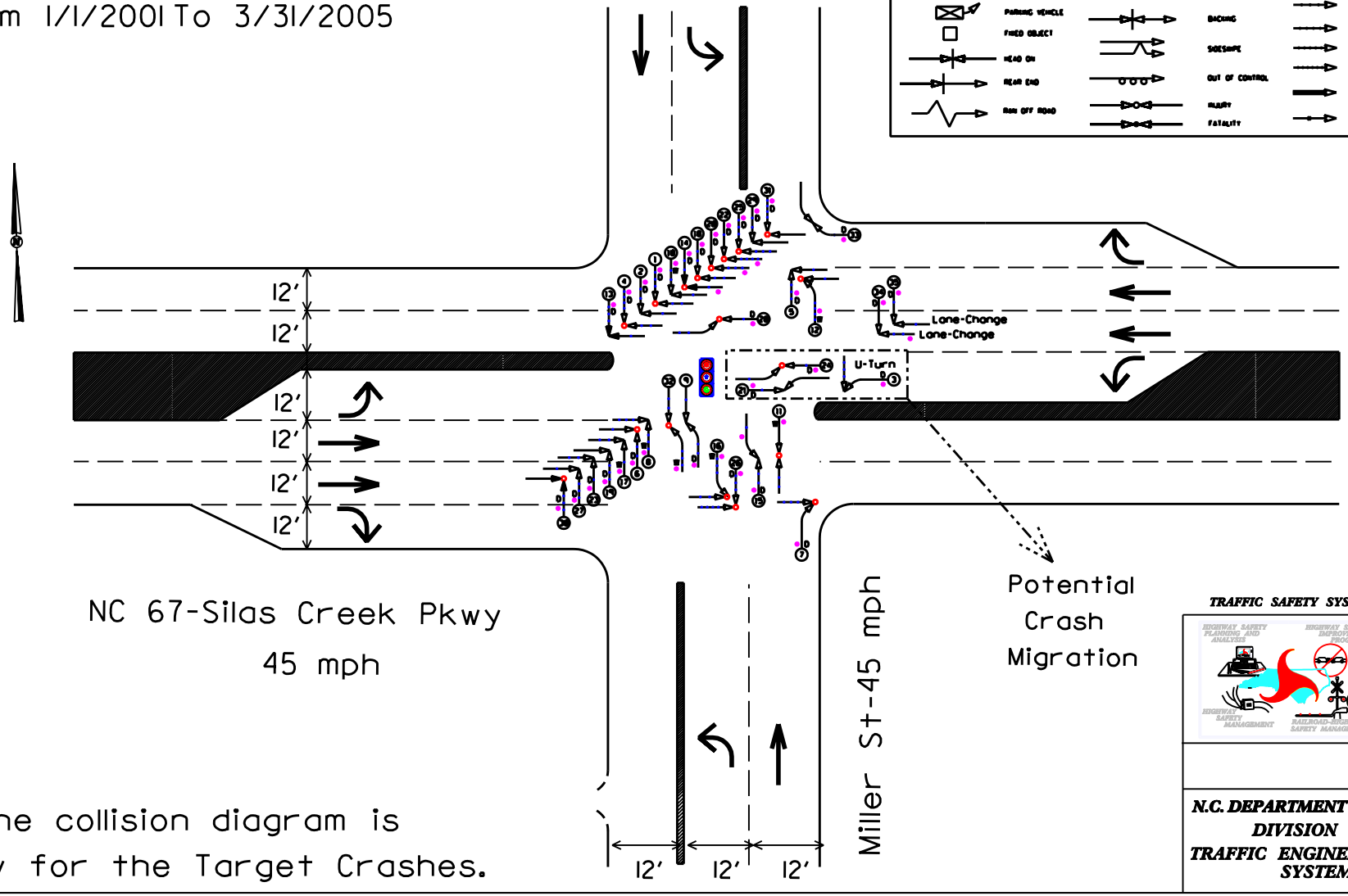
Forsyth County
NC 67 - Silas Creek Pkwy at Miller St
Treatment Site in The After Period
From 1/1/2001 To 3/31/2005



* The collision diagram is only for the Target Crashes.

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM
DIVISION: 09 AREA:
STUDY PERIOD: 7/1/1996 to 9/30/2000
DISTANCE: Y-LINE : 0 FT
ANALYSIS PREPARED BY: Majed Bazzari
ANALYSIS CHECKED BY:
DIAGRAM PREPARED BY: Majed Bazzari
DIAGRAM REVIEWED BY:
SCALE: NOT TO SCALE
DATE: 12/19/2005
LOG NUMBER: 20050054 SS 09-99-202

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